

This listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1. (Currently amended) An energy efficient pump apparatus, comprising:
 - a first closed conduit having a first and a second end;
 - a first movable piston [[with]] having a closed end having an effective length A greater than a median radius of [[said]] the first closed conduit, [[said]] the first movable piston being loosely disposed within [[said]] the first closed conduit such that a first gap having a predefined median size is formed between [[said]] the first movable piston and [[said]] the first closed conduit[[;]],and
a flexible drive member connected to a top end of the first movable piston and operable to move the first movable piston up and down along the first closed conduit,
 - (i) wherein [[said]] the first movable piston is movable in [[said]] the first closed conduit at a velocity relative to [[said]] the first closed conduit such that as [[said]] the first movable piston moves along [[said]] the first closed conduit, [[said]] the first movable piston creates a substantially tortuous leak path forming a hydrodynamic seal between [[said]] the first movable piston and [[said]] the first closed conduit, thereby enabling [[said]] the first movable piston to displace fluid along [[said]] the first closed conduit[[;]], and
 - (ii) an efficiency of [[said]] the hydrodynamic seal is based on [[said]] the predefined median size of [[said]] the first gap, [[said]] the effective length A of [[said]] the first movable piston, and [[said]] the velocity of [[said]] the first movable piston.
2. (Currently amended) The pump apparatus of claim 1 wherein [[said]] the first movable piston further comprises includes a one-way valve disposed therein, and the first movable piston and the first closed conduit are arranged such that when [[said]] the first movable piston is moved back

and forth along [[said]] the first closed conduit, [[said]] the first movable piston pulls and pumps fluid along [[said]] the first closed conduit.

3. (Currently amended) The pump apparatus of claim 2 wherein [[said]] the first closed conduit is positioned at an angle other than horizontal, and said the first closed conduit further comprises includes a one-way inlet valve at a lower portion thereof, and the first movable piston and the first closed conduit are arranged such that when [[said]] the first movable piston is moved up and down along [[said]] the first closed conduit, fluid is pulled into and pumped up [[said]] the first closed conduit.

Claims 4-5. (Cancelled)

6. (Currently amended) The pump apparatus of claim [[5]] 1 further comprising a pipe having a top end and a bottom end, wherein (i) [[said]] the bottom end of [[said]] the pipe is attached to [[said]] the top end of [[said]] the first closed conduit, (ii) during an up-stroke of [[said]] the pump apparatus, [[said]] the first movable piston is pulled up by [[said]] the flexible drive member, and (iii) during a down-stroke of [[said]] the pump apparatus, [[said]] the first movable piston is pulled down by gravity, thereby pulling and pumping fluid into and up [[said]] the pipe.

7. (Currently amended) The pump apparatus of claim 6 further comprising:

 a second closed conduit having a top end and a bottom end, and including an outlet disposed at a lower end of the second closed conduit; and

 a second movable piston loosely disposed within [[said]] the second closed conduit such that a second gap having a predefined median size is formed between [[said]] the second movable piston and [[said]] the second closed conduit, [[said]] the second movable piston including a rigid drive member[[;]].

 wherein [[said]] the bottom end of [[said]] the second closed conduit is attached to [[said]] the top end of [[said]] the pipe[[;]], and

during operation of [[said]] the pump apparatus [[said]] the first and second movable pistons move in [[said]] the respective first and second closed conduits to facilitate fluid flow into [[said]] the first closed conduit, such that the fluid flows into and up [[said]] the pipe on the up-stroke, and out of [[said]] the outlet under pressure on the down-stroke.

8. (Currently amended) The pump apparatus of claim 7 further comprising an outlet pipe connected to the outlet at the lower end of [[said]] the second closed conduit and a one-way outlet valve disposed in [[said]] the outlet pipe to limit the amount of force required to move [[said]] the first and second movable pistons on the up-stroke.

9. (Currently amended) The pump apparatus of claim 7 further comprising:

a closed sleeve outlet conduit comprising a closed sleeve and an outlet pipe connected to an upper portion of [[said]] the closed sleeve, [[said]] the closed sleeve outlet conduit covering [[said]] the second closed conduit and creating a second gap between an outer wall of [[said]] the second closed conduit and an inner wall of [[said]] the closed sleeve, such that [[said]] the second gap is sealed both at a bottom and a top of [[said]] the closed sleeve outlet conduit, and such that substantially any fluid flowing through [[said]] the outlet at the lower end of [[said]] the second closed conduit flows into [[said]] the second gap,

wherein during operation of [[said]] the pump apparatus [[said]] the first and second movable pistons move in [[said]] the respective first and second closed conduits to facilitate fluid flow into (i) [[said]] the first closed conduit, into and up [[said]] the pipe and into [[said]] the second closed conduit during the up-stroke, and (ii) through [[said]] the opening of [[said]] the second closed conduit, into [[said]] the sleeve-conduit gap and out of [[said]] the outlet pipe under pressure during the down-stroke.

10. (Currently amended) The pump apparatus of claim 9 wherein [[said]] the sleeve outlet pipe includes a one-way valve disposed therein to limit the amount of force required to move [[said]] the first and second movable pistons on the up-stroke.

Claims 11–31. (Cancelled)